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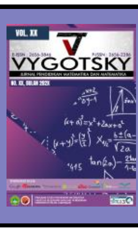

Students' Concept Understanding in Solving Mathematical Literacy Problems on The Material of Linear Equations of Two Variables

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ABSTRACT

This study aims to describe how well students understand concepts when working with linear equations with two variables in math literacy assignments. The study design uses descriptive qualitative approach. The study subjects were two eighth-grade students based on three categories of conceptual understanding determined during the data reduction procedure to become study participants taken at SMP Negeri 1 Lamongan. The data collection involves providing mathematical literacy exercises on linear equation of two variables (SPLDV) and conducting interviews. Students with medium understanding could grasp basic concepts but struggled with reasoning and complete representations, while those with low understanding relied on memorization and failed to translate real-world problems into mathematics, indicating a strong link between conceptual depth and mathematical literacy performance.

1. Introduction

Mathematics is a basic science that must be learnt by students and is always related to concepts. A concept in mathematics is an abstract idea that makes it possible to classify an object whether or not it belongs to that abstract idea (Hudojo, 2005). Concepts are (abstract) ideas that can be used or allow someone to classify or classify an object (Wardhani, 2008). If students grasp an idea, they can study mathematics with ease. Students must comprehend these ideas in order to learn mathematics more efficiently and use it in a variety of situations. Most of the students demonstrated significant difficulty in presenting contextual problems in mathematical form, particularly in formulating a mathematical model that aligned

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with the problem narrative. This finding aligns with the study results (Maria et al., 2022). Permendiknas No. 58 of 2014 explains that comprehending mathematical concepts is one of the teachings in mathematics.

Understanding concepts is the most crucial component of studying maths. Understanding a concept involves more than just mastering the subject. It also involves pupils being able to re-express ideas in a way that makes them easier to comprehend and implement (Fajar, 2018). Planting new mathematical concepts or ideas must be oriented to the previous concepts that students have learned, because students will understand better if the new concept they learn are related to the old concepts they already know (Hudojo, 1979).

The studyer draws the conclusion that grasping an idea is a process of mastering something that includes the capacity to explain, re-express, and relate concepts using their own phrases while maintaining the same meaning. This conclusion is based on the understanding of concepts by multiple specialists. A measurement device, or indicator, is required to ascertain the degree of comprehension of student concepts. This study uses indicators that refer to the opinion of Hudojo (1988), (Wardhani, 2008) and (Shadiq, 2009), namely (1) sorting objects based on their properties (according to the concept), (2) providing examples and non-examples of concepts, (3) transforming concepts into mathematical representations, (4) applying the relationship between concepts and procedures, and (5) applying concepts for problem solving.

When it comes to solving mathematical difficulties, conceptual understanding is a crucial starting point. "Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge " is the National Council of Teachers of Mathematics' learning principle, which states that students must learn mathematics by comprehending and actively building new knowledge from experience and prior knowledge (NCTM, 2000). This is because many mathematics concepts have a strong relationship between one concept and another. The desired learning objectives are not met if pupils do not grasp the fundamentals of mathematics, and it is inevitable that they will struggle to solve mathematical problems.

Mathematical difficulties are not just routine problems; they can also be problems encountered in daily life. Mathematical literacy is a measure of the capacity to use mathematical concepts in everyday situations. The capacity to solve issues, particularly non-routine ones that call for novel applications of mathematical knowledge, is known as mathematical literacy (Schoenfeld, 1992). Therefore, mathematical literacy is important for students. According to Ojose (Ojose, 2011), "mathematics literacy is the knowledge to know and apply basic mathematics in our everyday living" it indicates Mathematics literacy is the capacity to comprehend and apply basic mathematics in day-to-day situations. According to Stacey (Stacey, 2011), The PISA 2006 evaluation defines mathematical literacy as the ability of people to conceive, apply, and evaluate mathematical concepts in a variety of contexts. Formulating entails identifying and characterizing mathematical concepts in practical contexts (OECD, 2018). It is about translating problems from real-world contexts into mathematical form. Applying mathematical ideas, methods, and logic to solve issues in a mathematical setting is known as "using". It involves selecting and using appropriate mathematical tools and techniques (Niss, 2003). It involves understanding the meaning and implications of the mathematical results. Mathematical literacy supports students to understand the function and use of mathematics in everyday

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applications (Yuliyani & Setyaningsih, 2022). According to Geraldine & Wijayanti (Yuliyani & Setyaningsih, 2022) The ability to understand, interpret, and apply mathematics to real-world issues is known as mathematical literacy.

Algebra is a fundamental branch of mathematics that plays a crucial role in solving real-world problems. Among its key topics, the system of linear equations of two variables (SPLDV) is particularly important for students to understand, as it provides a foundational tool for modeling and solving everyday contextual problems. The SPLDV material is one example of a mathematical environment that can be used in daily life. The importance of SPLDV in mathematical literacy is to develop contextual problem solving skills. The ability to translate real-world scenarios into mathematical representations and interpret solutions back in context is a core component of mathematical literacy (OECD, 2019). In addition, to deepen algebraic understanding, working with SPLDV contributes to a deeper understanding of fundamental algebraic concepts such as variables, equations, and systems of equations. Students learn how to meaningfully manipulate symbols to represent and solve problem. This strong conceptual understanding is important for the development of mathematical literacy (Kieran, 2007).

Mathematical literacy problems can be used to measure students' understanding in using mathematical symbols and numbers at the stage of solving problems related to everyday life. The strategy of developing mathematical literacy has its own role in the approach to learning mathematics, namely by using contexts that are closely related to students' daily experiences, always connecting them to various mathematical topics in the real world, then focusing on understanding concepts and reasoning in context, not just on skills in counting or computing (Susanto et al., 2021). Mathematical literacy is very important because it is not just about memorizing formulas, but includes critical thinking skills to interpret, analyze, and solve problems that involve numerical information (Salvia et al., 2022). The added value of mathematical literacy extends beyond understanding arithmetic, but more importantly, it develops problem-solving skills through logical reasoning and rational decision-making (Kusumah, 2011). One may argue that raising students' mathematical literacy can benefit in their development of the capacity to comprehend mathematical ideas when they are learning the subject.

In general, Indonesian students lack mathematical literacy. This can be seen from the PISA survey, which is an international level study in the context of assessing learning outcomes, one of which aims to test the mathematical literacy of 15-year-old students. Based on the results of the PISA survey obtained, the ranking of mathematical literacy obtained by students in Indonesia is ranked 69 out of 18 countries in 2022. Based on the PISA survey, we can know that the mathematical literacy skills of students in Indonesia are still below average. One of the reasons for the low literacy skills of students in Indonesia is the lack of introduction to numeracy problem-based exercises. The requirement for an assessment system in the execution of the learning process stems from the inadequate numeracy literacy of the pupils. Thus, to solve the existing problems, a solution is needed. One of the appropriate solutions to be implemented is to provide practice problems based on mathematical literacy. By providing practice problems based on mathematical literacy, it can indirectly train studentsconcept understanding, so that the more often students work on mathematical literacy problems, it will be able to improve students' concept understanding in solving mathematical literacy-based problems.

The ability to understand the right concepts will help students in linking the

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relationship between the concepts studied. But in reality, students still have low concept understanding skills. This is evidenced by the results of study conducted by Herawati & Kadarisma (Herawati & Kadarisma, 2021) which concluded that when students solve algebraic operation problems, students have difficulty because they do not understand the concept. The overall percentage of concept understanding ability indicators reached 54.40%. The study's findings show that pupils have a poor conceptual understanding when it comes to solving algebraic operation issues. Furthermore, the findings of a study by Mayasari and Habeahan (Mayasari & Habeahan, 2021) demonstrate that pupils in the low group have a 73% concept understanding ability when it comes to completing mathematical story problems. It is clear from the explanation of some concept understanding study findings that pupils' conceptual comprehension skills remain comparatively low. Students' inability to explain or recite the concepts they learn and to present them in mathematical representations is the factor that contributes to their inadequate concept understanding capacity.

Students' ability to understand mathematical concepts in solving problems involving systems of linear equations with two variables is still in the low category, as evidenced by students' inability to restate the solution to the given problem (Khairunnisa & Aini, 2019). Students' mathematical conceptual understanding ability in the linear programming material is low, with none of the conceptual understanding indicators being met, while students in the medium category only met one conceptual understanding indicator, namely the extrapolation indicator (Maure et al., 2020). The results of the analysis of students' mathematical concept understanding abilities are mostly in the low category (Fajar et al., 2019). Based on the problems that have been described, studyers want to describe students' concept understanding in solving mathematics literacy problems on the material of linear equations of two variables.

2. Method

This study employs a qualitative, descriptive study design. Thirty-one students participated in this March study at SMP Negeri 1 Lamongan. Data reduction, data presentation, and conclusion drawing are some of the data analysis approaches that are employed Miles & Huberman (Darmawan & Yusuf, 2022). The data collection procedure begins with giving mathematical literacy questions on the material of linear equations of two variables and the interview stage. In the data reduction stage, the studyer started by correcting the students' test results, then categorising students into 3 levels, namely students with a high level of concept understanding, students with a medium level of concept understanding, and students with a low level of concept understanding. These categories are based on grouping criteria using student scores (x), student average scores ($\bar{x}$), and standard deviation (s). The high level for $x > \bar{x} + s$, the medium level for $\bar{x} - s \leq x \leq \bar{x} + s$, and the low level for $x < \bar{x} + s$ (Arikunto, 2010).

The studyer selected two students from each level of understanding of student concepts to be used as study subjects because this selection will be used as a separate unit of analysis for in-depth interviews on how they build and develop an understanding of mathematical concepts when facing and solving problems on the material of two-variable linear equation systems. At the data presentation stage, the data obtained were focused and classified according to the indicators of concept understanding from Hudojo (1988), (Wardhani, 2008), and (Shadiq, 2009). Presentation in narrative form with the aim of combining information so that it can

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describe the situation that occurs. The interview method in this study is semi-structured interview. Drawing conclusions aims to achieve the study objectives

The studyer is the primary tool used in this study. In addition to planning, studyers also gather, analyze, and report on data. Studyers also have supporting instruments, namely mathematical literacy questions and interview guidelines. The interview guidelines in this study were adjusted to the indicators of concept understanding previously described. Processing of test results obtained by students is statistical in the form of scores according to indicators of understanding of mathematical concepts and percentage qualifications based on (Arikunto, 2013).

3. Results and Discussion

The purpose of this study is to characterize how well students comprehend concepts when tackling mathematical literacy tasks using linear equations of two variables. Each student is given four description questions, each of which contains several indicators that measure understanding of a mathematical concept. The data generated from this study is in the form of scores obtained by students in testing the ability to understand concepts when answering questions related to SPLDV material. Student test results were analysed using rubric scoring guidelines for understanding mathematical concepts. The scores of each test item were summed up for each student. Based on the scores obtained, students were grouped according to high, medium and low groups.

Table 1. Test Results of Concept Understanding of Class VIII Students

Number of Students	Maximum Value	Minumum Value	Average
31	100	20	78.61

From the data listed in the Table 1, the measurement test of students' concept understanding ability shows that they have not succeeded in achieving the Minimum Completion Criteria (KKM) value determined by the school for class VIII, which is 82. The range of values recorded recorded the maximum value of students reached 100, while the minimum value was recorded as 20, with an average value of 78.61. This assessment is calculated from the scores that have been converted to a scale of 1-100 by comparing the individual student's score to the total maximum score that can be obtained, then multiplying it by 100. Information related to the percentage of students who reached the KKM score can be seen in Table 2.

Table 2. Results of Analysis of Student Concept Understanding Indicators

KKM Category	Value	Number of Students	Percentage
Achieved	> 82	9	29%
Not Achieved	< 82	22	71%

It can be seen in Table 2 that student assessments have been classified according to the achievement of the KKM. The results show that about 29% of the total number of students, or equivalent to 9 students, have reached or exceeded the KKM value set by the school. Meanwhile, about 71% of the students, or 22 other students, have not achieved the specified KKM score. Furthermore, to determine the high and low percentage of understanding of concepts in solving problems in students according to Arikunto (Arikunto, 2012) by means of standard deviation.

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Table 3. Level of Concept Understanding of Class VIII Students

Category	Value Interval	Number of Students	Percentage
High	$Value \geq 89.61$	8	26%
Medium	$67.3 < Value < 89.61$	20	64%
Low	$Value \leq 67.3$	3	10%

Table 3 shows the level of understanding of grade VIII students of SPLDV material through solving related problems. In the high category, 8 students or 26% of all students scored more than 89.61. In contrast, the low category consisted of 3 students (10%) with a score of less than 67.3. The majority of students, around 64%, fell into the medium category with 20 students scoring between 67.3 and 89.61. These results indicate that students in class VIII who fall into the high category have been able to understand the SPLDV material well, as reflected in the highest score of 100. However, the results of this category only apply in the context of class VIII and are specific study subjects in this study. Based on the explanation of the study results from the value of each indicator, there were 3 students who got the maximum score when solving questions about SPLDV material.

Eight students demonstrated a high degree of concept understanding, twenty shown a medium level, and three demonstrated a poor level, according to the findings of the exam questions completed by thirty-one students. Additionally, two pupils were chosen as study subjects from each conceptual understanding level. S1 and S2 represent study subjects with a high level of concept comprehension, S3 and S4 represent study subjects with a medium level of concept understanding, and S5 and S6 represent study subjects with a low level of concept understanding.

Studyers analysed students' answers according to the indicators of concept understanding. Based on the data obtained after analysing the data on students' answers, students' abilities on each indicator of concept understanding can be observed in Table 4.

Table 4. Results of Analysis of Student Concept Understanding Indicators

No.	Concept Understanding Indicator	Percentage
1.	Sorting objects based on their properties	28%
2.	Providing examples and non-examples of the concept	23%
3.	Transforming concepts into mathematical representations	21%
4.	Applying the relationship between concepts and procedures	16%
5.	Applying concepts for problem solving	12%

Based on the data recorded in Table 4, it can be seen that the percentage of students' mastery of each indicator of students' concept understanding ability has a relatively small variation. The indicator that measures students' ability to sort objects based on their properties shows the highest percentage of mastery with a score of 28%. Meanwhile, the indicator that measures students' ability to apply concepts for problem solving has the lowest percentage of mastery, only reaching 12%. From the analysis of the percentage of score achievement on each indicator, it was found that the majority of mathematical concept understanding ability of grade VIII students was still at a moderate level. This is due to the number of students who have not reached the maximum score on each indicator of understanding mathematical concepts. The results of the analysis of indicators of concept understanding in students are as follows:

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1. Sorting Objects Based on Their Properties
   In the first indicator, students must be able to classify objects based on certain properties according to the concept. Students are asked to explain the meaning of SPLDV and state which are coefficients, variables, and constants in an equation.

The examination of the test question responses on this indicator reveals that subjects S1, S2, S3, and S4 are able to accurately and precisely classify things based on certain features in accordance with their conceptions and describe the meaning of linear equations of two variables (SPLDV). Because they can comprehend the fundamental ideas of SPLDV and practice enough conceptual issues, study participants can readily identify characteristics with the concept of SPLDV and define it, according to the findings of their interviews.

Subject S5 provided a partial explanation of the meaning of linear equations involving two variables, however S5 mistakenly classified items based on specific features in accordance with the concept. This is evident in subject S5's work, which is supported by the findings of the subsequent interview. Excerpts of the interview results of subject S5

P : "*OK, now let me ask you, what is SPLDV?*"
S5 : "*an equation that has two variables*"
P : "*Can you tell which are the variables, constants and coefficients of the equation y=12000+3000(x-2)?*"
S5 : "*the variables are x and y, the coefficient is 3000, and the constant is 12000*"

In the meantime, subject S6 provided a less accurate explanation of the meaning of linear equations involving two variables, and S6 erroneously classified items based on specific attributes in accordance with the concept. This is evident in subject S6's work, which is supported by the findings of the subsequent interview. Excerpts of the interview results of subject S6

P : "*OK, now let me ask you, what is SPLDV?*"
S6 : "*SPLDV has two variables*"
P : "*Can you tell which are the variables, constants and coefficients of the equation y=12000+3000(x-2)?*"
S6 : "*the variables are x and y, the coefficient is 12000, and the constant is 3000.*"

Based on the results of interviews with S5 and S6, it is known that the reason the subject does not understand the definition and properties of SPLDV is that the subject does not understand the definition of SPLDV and only memorises the concept of SPLDV. In addition, the subject is also difficult to identify or distinguish properties that are relevant to the concept of SPLDV. According to Astuti et al. (Astuti et al., 2018) explains that the ability of students to locate, convey, comprehend, parse in many ways, and draw inferences about a concept based on their knowledge is a component of concept understanding.

2. Provide Examples and Non-Examples of The Concept
   Students must be able to give both instances and non-examples of a topic in

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order to pass the second indicator. Based on their work on test questions, students are requested to provide instances and non-examples of the idea of linear equations of two variables, along with the justifications for their answers.

The results of the analysis on this indicator show that subjects S1, S2, S4, and S6 can provide examples and non-examples as well as the reasons for the concept of linear equations of two variables correctly. Based on the interview results, it is known that the reason they can fulfil this indicator is that they are used to thinking critically if given non-routine problems and understand how the concept is applied in a real context.

Subjects S3 and S5 are able to correctly give instances and justifications for the idea of linear equations of two variables, but they make mistakes when defending non-examples of the concept. This can be seen in the work of subjects S3 and S5 which is reinforced by the following interview results. Excerpts of the interview results of subject S3

P : "*Can you name any non-examples of SPLDV?*"
S3 : "*You can, for example* $3y = 12 - y$"
P : "*why isn't it a SPLDV?*"
S3 : "*because it has 2 variables, namely 3y and -y*"

Excerpts of the interview results of subject S5

P : "*Can you name any non-Examples of SPLDV?*"
S5 : "$2x + 3y = 5$ "
P : "*why isn't it part of PLSV?*"
S5 : "*because there are 3 variables*"

According to the results of the interviews, subject S3's inability to provide examples and non-examples of the concept of linear equations of two variables and their causes is known to be caused by a lack of practice problems, which prevents him from developing critical thinking skills and makes it difficult for him to create examples based on concepts. Meanwhile, subject S5 did not fulfil this indicator due to the influence of memorisation. Without comprehending how the idea was used to solve contextual difficulties, the individual merely committed the notion of SPLDV to memory. This finding is in line with the views expressed by (Mulyani et al., 2018) and (Maryanti & Zulfarazi, 2022) which show that students' inability to understand mathematical concepts and respond to learning problems can be related to their lack of understanding of the material being taught. This is among the elements that affect how hard it is for students to grasp a mathematical idea.

3. Transforming Concepts into Mathematical Representations
   Students must be able to translate ideas into mathematical representations in order to pass the third indicator. The problem's concepts must be presented by the students using a variety of mathematical representations. Students' skills in the third indication for questions a and b are described as follows:

The subject can convey the problem's ideas in a mathematical representation, according to the findings of the study of S1 and S2 responses. In problem alphabet

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a, S1 and S2 can represent data or information into mathematical form, namely tables. While question alphabet b, S1 and S2 can make a mathematical model of the information given which is one form of mathematical representation. This can be seen in the work of S1 and S2 which is reinforced by the following interview results.

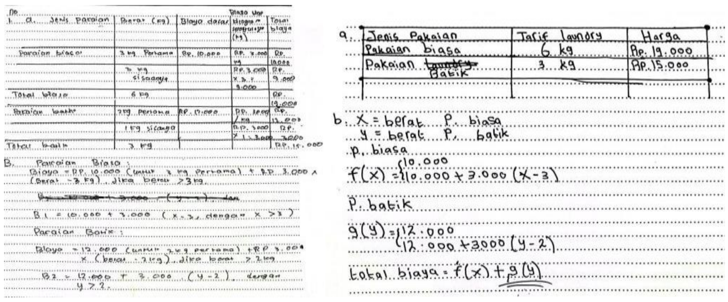

Figure 1. S1 and S2 Answers to Question Alphabets a and b

According to the findings of the analysis of S1 and S2 responses, which were supported by the findings of the interviews, in problem alphabet a S1 and S2 it can be seen that the subject did not write completely in representing into tabular form. In problem alphabet b, S1 immediately wrote down the mathematical model and did not write the memorisation. While S2 wrote down the memorisation but there were still errors. But during the interview, S1 and S2 could explain what was written on the answer sheet. So that S1 and S2 are able to fulfil the indicators of converting concepts into mathematical representations. This supports Wardono & Mariani's assertion that gifted students can effectively explain the problem-solving procedure and accurately assess the outcome (Wardono & Mariani, 2018).

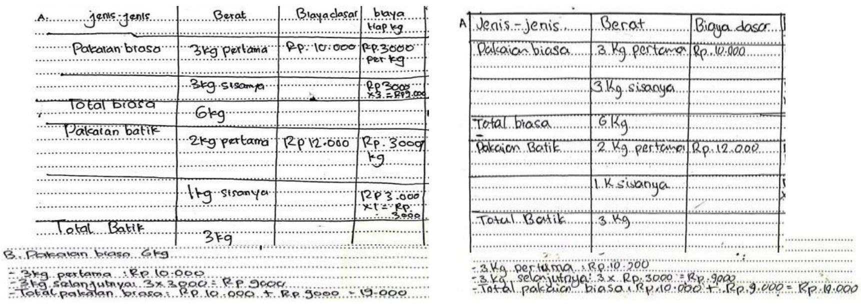

Figure 2. Answers of S3 and S4 Problem Alphabets a and b

According to the findings of the analysis of S3 and S4 responses, which were supported by the findings of the interviews, in question alphabet a S3 and S4 it can be seen that the subject does not write completely in representing into tabular form based on the information given. In question alphabet b, S3 and S4 represent the information given in verbal form or words. But during the interview, S3 and S4 can explain what is written on the answer sheet. So S3 and S4 are able to fulfil the indicators of converting concepts into mathematical representations.

Figure 3 describes that the results of the analysis of the answers of S5 and S6 which are strengthened by the results of the interview, in question alphabet a S5 did not write completely in representing into tabular form based on the information given. Meanwhile, S6 only rewrote the information given in the problem. In problem alphabet b, S5 and S6 could not represent mathematically the information or data given. Based on the results of interviews with S5 and S6, it is

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known that the subject cannot explain what is written on his answer sheet. So that S5 and S6 were unable to fulfil the indicator of converting concepts into mathematical representations.

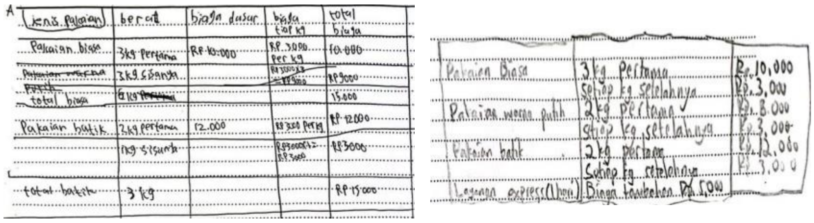

Figure 3. S5 and S6 Answers to Problem Alphabet a

The study of this indicator's results demonstrates that S1, S2, S3, and S4 in questions a and b are capable of accurately and exactly presenting the problem's notions in a mathematical representation. Although not exactly, S5 and S6 in alphabet a were able to accurately convey the problem's notions in a mathematical formulation. In question alphabet b, subjects S5 and S6 were unable to translate the problem's ideas into a mathematical representation. Based on the interview's findings, it is known that their inability to demonstrate an idea in another format stems from a lack of technical expertise.

Subjects are not used to understanding tools or methods for making representations such as graphs or tables so it is difficult to connect abstract concepts with more concrete representations. According to (Duval, 2017) the difficulty in linking different representations is because mathematics uses a variety of representations, such as symbols, graphs, diagrams, tables, and verbal language, which makes students' inability to connect these representations meaningfully hamper their mathematical representation skills.

4. Apply the relationship between concepts and procedures
   In the fourth indicator, in order to solve problems, students need to be able to understand how concepts relate to methods. Students are expected to correctly use the concepts and processes to solve the given problem. The following is a description of students' abilities in the fourth indicator for question alphabet c:

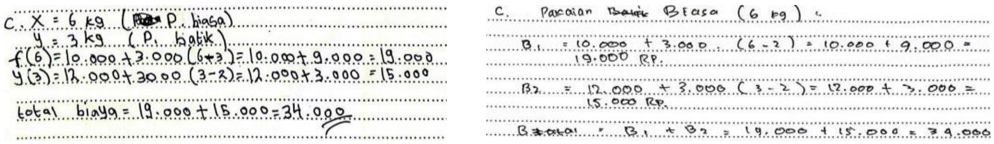

Figure 4. S1 and S2 Answers to Question Alphabet c

The results of the analysis on this indicator show that subjects S1 and S2 can apply concepts and procedures appropriately. This can be seen from the results of the work of subjects S1 and S2 in Figure 4. S1 and S2 can utilise and select the relationship between concepts and procedures of questions alphabets a, b, and c correctly. Meanwhile, subjects S3 and S4 were less careful in understanding the problem so that they were less precise in connecting concepts and procedures. This can be seen in the work of the study subjects in Figure 5 below.

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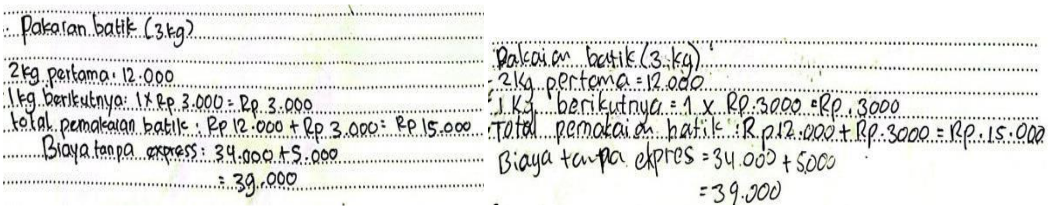

Figure 5. Answers of S3 and S4 Problem Alphabet c

According to the findings of the analysis of S3 and S4 responses, which were supported by the findings of the interviews, in question alphabet c S3 and S4 are less careful in understanding the problem so that they cannot connect concepts and procedures appropriately. This is in line with Azzahra's opinion (Azzahra, 2019) regarding the factors that cause student errors in solving problems, such as rushing to read the problem, lack of understanding of the contents of the problem, and forgetfulness of the right methods and steps to solve it.

Meanwhile, subjects S5 and S6 based on the results of the interview, it is known that the reason the subject has not fulfilled this indicator is that they have not practised conceptual problems often enough so that they are not automatically understood. This is in line with the opinion of Wardono & Mariani (Wardono & Mariani, 2018) that one of the factors causing low student scores in Indonesia is that Indonesian students are less trained in solving contextual problems. The difficulties students encounter when tackling problems involving SPLDV material include their incapacity to comprehend the information at hand, their incapacity to convert the problem narrative into a mathematical sentence structure, and their inability to comprehend the SPLDV concept, which makes it difficult for them to come up with a solution (Maspupah & Purnama, 2020).

5. Apply concepts for problem solving
   In the fifth indicator, students must be able to apply concepts for problem solving in mathematics problems. Students are given a problem about mathematics literacy in everyday life, then students are asked to apply a concept based on the right steps.

The results of the analysis on this indicator show that subjects S1 and S2 can apply concepts to problem solving based on appropriate and correct steps without any errors. This can be seen from the work of subjects S1 and S2 in Figure 6 below.

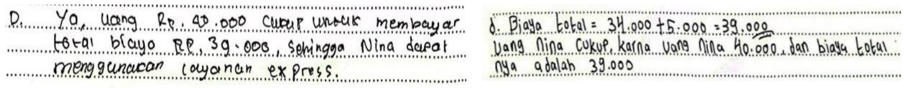

Figure 6. S1 and S2 Answers to Question Alphabet d

Subjects S3 and S4 in problem alphabet d made mistakes in applying concepts to problem solving. This can be seen from the results of the subject's work in Figure 5. Meanwhile, subjects S5 and S6 were unable to apply concepts for problem solving appropriately. Based on the results of the interview, it is known that the reason the subject has not fulfilled this indicator is that he is only used to working on routine problems so that it is difficult to think creatively if given contextual problems so that it is difficult to analyse the problem to determine which concepts are relevant.

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According to Sumarmo (Sumarmo, 2000) explains problem solving as a process that is carried out to overcome the obstacles faced with the aim of achieving the desired results. This study provides valuable insights into students' ability to apply mathematical concepts to problem-solving. While its strengths lie in clear evidence and theoretical support, weaknesses such as the limited sample size and subjective interpretations suggest the need for further study with larger scales and more rigorous methods.

The The level of understanding of mathematical concepts in general significantly influences students' ability to solve mathematical literacy problems. Students with a high level of understanding demonstrate the ability to understand and classify concepts, flexibility in mathematical representation, and systematic application of concepts to problem solving. Students with an average level of understanding show potential but still require guidance in conceptual analysis and rigor. Students with a low level of understanding experience fundamental obstacles due to a predominance of rote memorization and a lack of experience with contextual problems. These findings indicate the importance of mathematics instruction that focuses on conceptual understanding, the use of mathematical representations, and contextual problem-solving skills, particularly to help students with an average and low level of understanding improve their mathematical literacy.

4. Conclusions

Based on the analysis of 31 eighth-grade students at SMP Negeri 1 Lamongan, the level of mathematical conceptual understanding of the topic SPLDV was generally medium, with 64% of students in the medium understanding category, 26% in the high category, and 10% in the low category. Students with a high conceptual understanding demonstrated comprehensive abilities in all indicators of conceptual understanding, including grouping objects based on their properties, providing appropriate examples and non-examples, transforming concepts into various mathematical representations, connecting concepts to procedures, and applying concepts in contextual problem-solving. They were able to think critically and did not rely solely on memorization.

Students with a medium understanding were able to grasp most concepts, but still had difficulty providing conceptual reasoning (especially for non-examples), creating complete mathematical representations, and accurately connecting information to procedures. They tended to be less thorough and were not yet fully accustomed to non-routine problems. Students with a low understanding experienced fundamental obstacles because they tended to simply memorize definitions without understanding their meaning, resulting in an inability to accurately identify important components such as variables, coefficients, and constants. They also struggle to transform information into mathematical representations and fail to apply concepts in problem-solving due to their familiarity with routine problems and lack of analytical thinking skills.

Factors influencing poor understanding of mathematical concepts include: reliance on memorization, lack of mastery of representation techniques (such as tables and mathematical models), and limited experience solving contextual problems. Therefore, a learning approach is needed that strengthens conceptual understanding, facilitates the use of various representations, and improves mathematical literacy skills through real-world contexts.

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Author Contributions

The first author helped to formulate the study and design the instruments and study procedures. The first author also served as an observer, gathered and examined data, produced the first draft, and made revisions in response to input from the second and third authors. The second and third authors served as consultants, offering suggestions, making significant changes to the document, and approving the article's final draft. Additionally, the final draft of the work has been read and authorized for publication by all authors.

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Declaration of Competing Interest

The author states that there are no conflicts of interest related to this work that are disclosed in this paper.

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